(12) UK Patent Application (19) GB (11) 2 167 512 A

(43) Application published 29 May 1986

(21) Application No 8528689

(22) Date of filing 21 Nov 1985

(30) Priority data

(31) 849180 (32) 23 Nov 1984 (33) ZA

(51) INT CL⁴
F16L 27/00 27/08

(52) Domestic classification
F2G 2F 2H 2J 2K 6C2

(56) Documents cited
None

(58) Field of search
F2G
Selected US specifications from IPC sub-class F16L

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(54) A variable angle pipe joint

(57) A variable pipe joint has a first element with a coupling portion having an annular channel 40 in its end in which a rim 34 formation of a coupling portion of a second element fits. In one embodiment a cup seal 44 is provided in the channel. With this embodiment two lips 42 are provided on either side of the channel with two grooves on either side of the rim formation in which the lips are received. In another embodiment a seal (148 Figure 6) having a cylindrical part (150) and an outwardly directed flange (152), is used. The cylindrical part is received in a first channel (140 Figure 4) to define a space between it and the inner wall of the channel. The rim formation (154) is received in this space. Preferably, the inner wall of the channel and the inner surface of the rim formation are complementarily sloped to urge the rim formation against the seal. A locking ring, (116 Figure 6) which clips in place, holds the first and second elements together with them still able to rotate relative to one another.

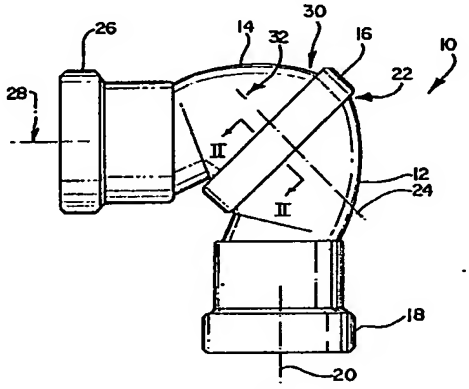

FIG 1

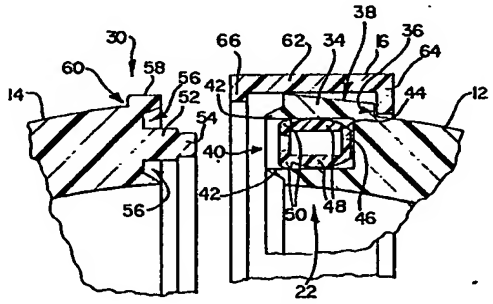

FIG 2

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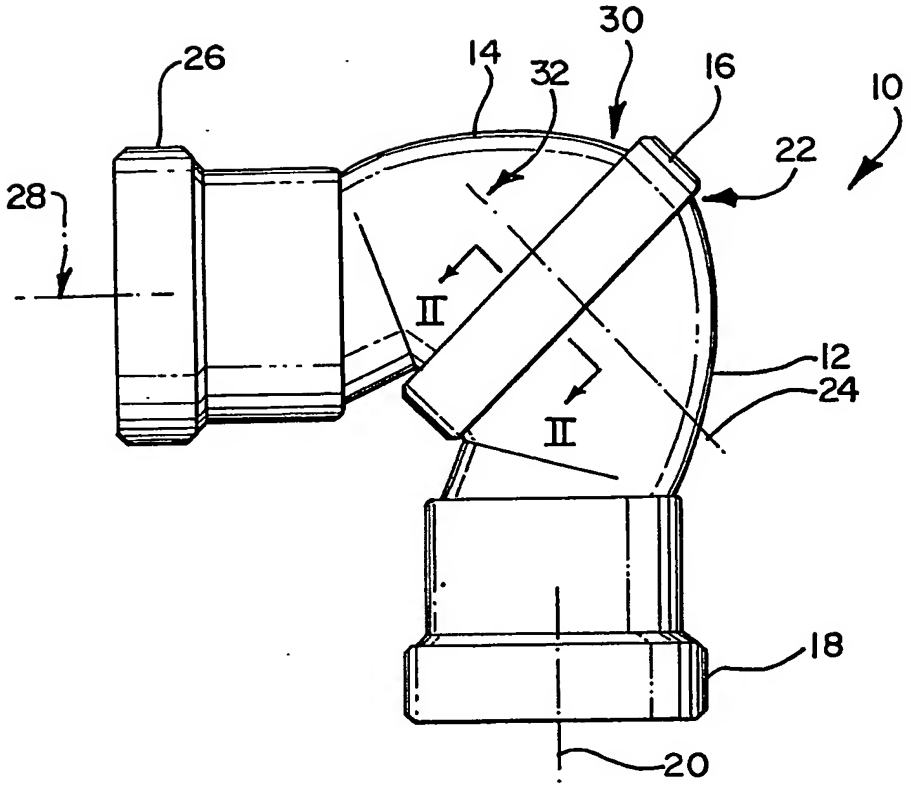
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FIG 1

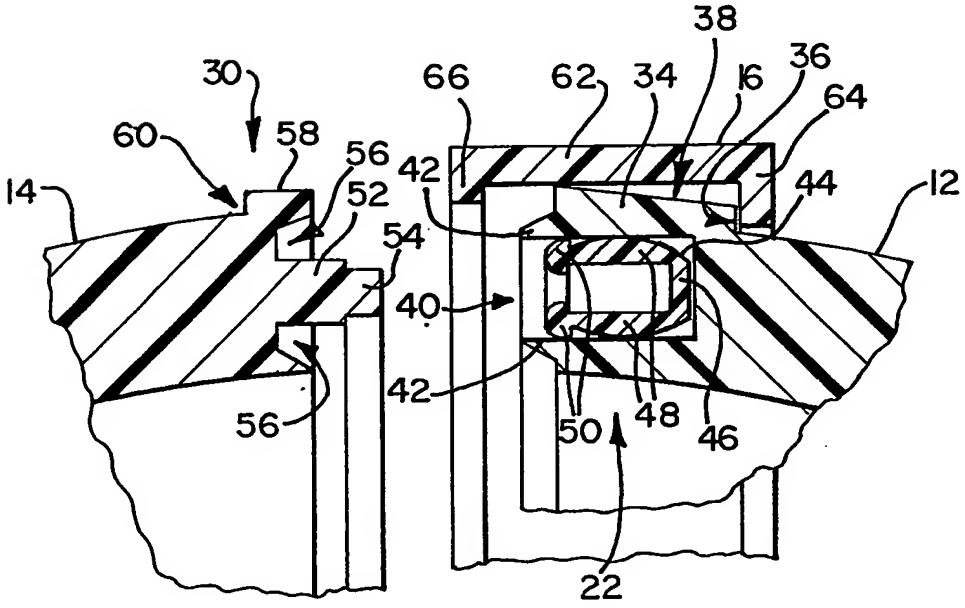
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FIG 2

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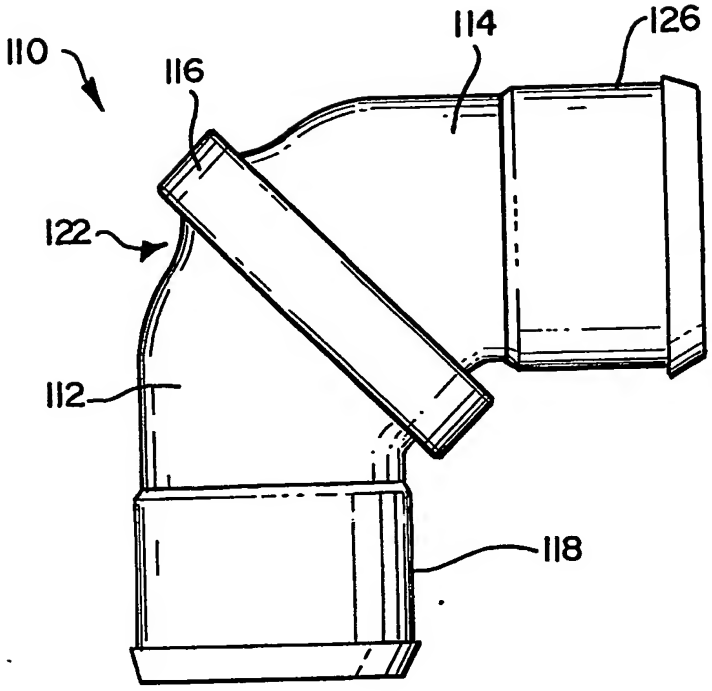


FIG 3

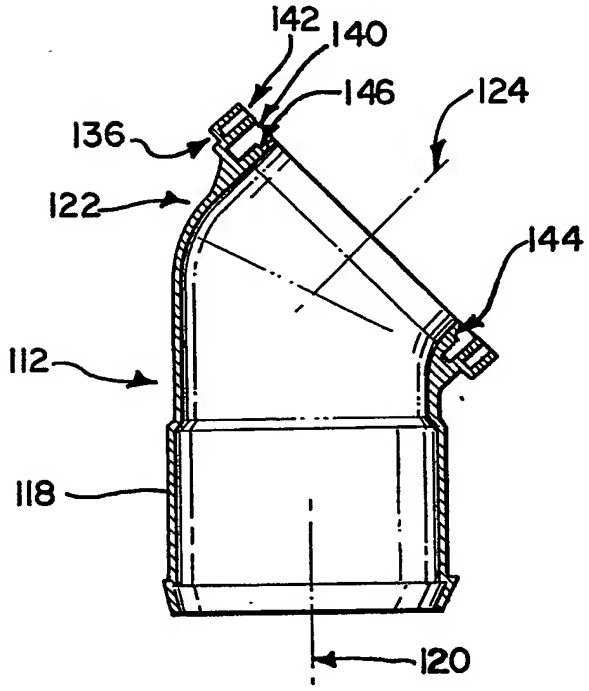
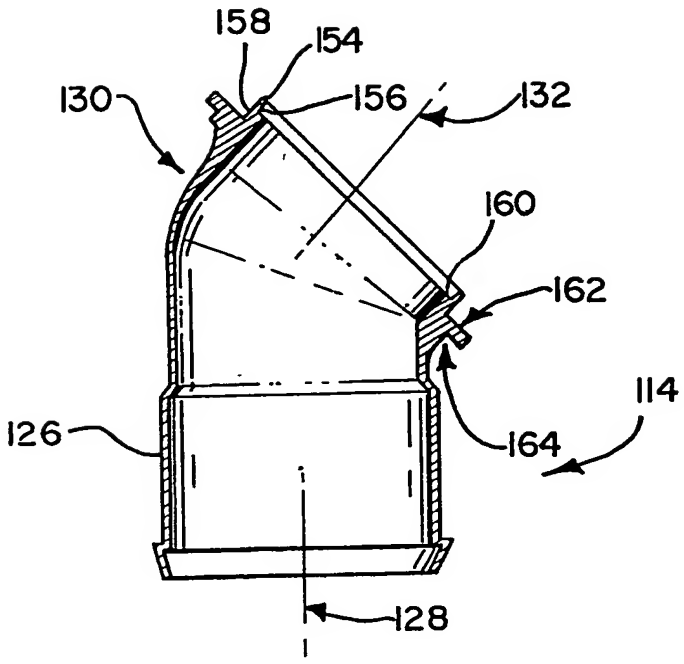


FIG 4


158
154
130
156
132
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162
114
126
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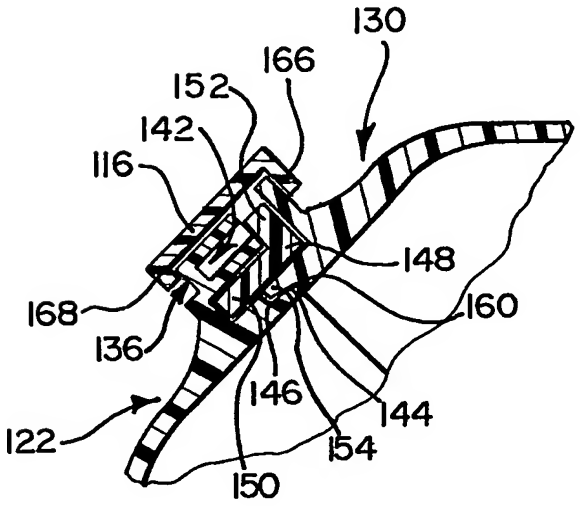
128

FIG 5


130
166
152
142
116
148
168
160
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146
144
122
154
150

FIG 6

SPECIFICATION

A variable angl pipe joint

This invention relates to a variable angle pipe joint whereby two pipes may be connected together with their respective axes in alignment or inclined to each other at an angle from 90 degrees to 180 degrees.

According to a first aspect of the invention there is provided a variable angle pipe joint which includes

a first hollow element having at one end a tubular coupling portion that is circular about a cylindrical axis and which has a first annular channel in an end region thereof, the first channel having an inner wall and an outer wall;

a seal member that has a first tubular portion receivable in the first channel to define a space between the inner wall and a first sealing surface thereof;

a second hollow element having at one end a tubular coupling portion that is also circular about a cylindrical axis and which has a rim formation that is sealingly receivable in the space, the rim formation having an inner surface and an outer surface that is sealingly engageable with the first tubular portion of the seal member; and

a locking ring for holding the first and second elements together in a coupled sealed configuration in which the cylindrical axes co-incide and the first and second elements are relatively pivotal about the co-incident axes.

The seal member may have an outwardly directed flange portion, the second element may have an annular surface around the rim formation and the first element may have a corresponding annular region, the flange portion being engageable between the annular surface and the annular region. A second annular channel may be provided in the first element in its annular region.

The inner wall of the first element may have a step engageable by the end of the rim formation. Similarly, the inner surface of the rim formation may also have a step. This step may be engageable by the end of the inner wall of the first element.

The inner surface of the rim formation may be engageable with the inner wall of the first channel. In order to ensure that there is good sealing contact between the outer surface of the rim formation and the seal member, the inner wall may be sloped such that the diameter thereof increases downwardly and the inner surface of the rim formation may be complementarily sloped.

Either or both of the first and second elements may have at th ir other ends a cylindrical joining porti n that is circular about a longitudinal axis that is an angle to the cylindrical axis f its c upling p rtion, the end f a pipe being engageable with thes joining porti ns.

In another embodiment, the seal member may be a cup seal having th first and a second tubular portion that ar joined together by an annular base web, so that the second tubular portion is locatable between the inner surface f the rim formation and the inner wall f the first channel. With this embodiment, the outer surface of the rim formation may also have a step. Further, in order to improve sealing contact between the surfaces of the rim formation and the seal member, the tubular portions of the seal member may be thicker between the ends and may also be enlarged at their free ends.

Further with this embodiment, the first element may have an axially projecting circumferential lip about its first channel on the outer side thereof and the second element may have a complementary annular channel around the rim formation, in which the lip is receivable. Similarly, a lip and channel may be provided on the other side of the first channel and the rim formation respectively.

Still further according to the invention there is provided a variable angle pipe joint which includes

a first hollow element having at one end a tubular coupling portion that is circular about a cylindrical axis and which has a shoulder adjacent its free end;

a second hollow element having at one end a tubular coupling portion that is also circular about a cylindrical axis and which has a shoulder adjacent its free end, the coupling portions being sealingly engageable with one another; and

a locking ring which has a first flange engageable with the shoulder of the first element and a second flange which has a larger internal diameter than the first flange and is of a suitable size to pass over the free end of the first element and clip over the shoulder of the second element to lock the first and second elements together.

The region between the shoulder and the free end of the coupling portion of the first element may be frusto-conical, being thicker at its free end.

The invention extends still further to a variable angle pipe joint having first and second elements as described above and earlier that are engaged with one another and are locked together by means of a locking ring which is also as described.

The first and second elements and the locking ring may be of a suitable synthetic plastics material and may be moulded in suitable moulds.

Those skilled in the art will appreciate that the joint may be a "two-part" joint, with the joining portions of the first and second elements being connectable to pipes. Alternatively, it may be a "three-part" joint with only two of the parts having the joining portions and a third part that has a coupling portion at both ends.

The invention is now described, by way of examples, with reference to the accompanying drawings, in which:-

Figure 1 shows a side view of a first embodiment of a pipe joint in accordance with th invention;

Figure 2 sh ws a secti ned view f a part f the j int indicating in more detail how th two elements of the joint mate together and how they ar l ck d together by the locking ring;

Figure 3 sh ws a sid view of a further embodiment of a pipe j int in accordance with the inv n-

tion;

Figure 4 shows a sectioned view of a first element forming part of the pipe joint:

Figure 5 shows a sectioned view of a second element forming part of the pipe joint; and

Figure 6 shows a sectioned view of a part of the joint indicating in more detail how the two elements mate together and how they are locked together by the locking ring.

Referring to Figures 1 and 2, the joint is designated generally by reference numeral 10. The joint 10 is formed from a first element 12, a second element 14 and a locking ring 16. The joint 10 is shown in Figure 1 in its assembled configuration and in Figure 2 in its unassembled configuration.

The first element 12 is hollow and has at one end a joining portion 18 that defines a longitudinal axis 20. The joining portion 18 is connectable to a pipe (not shown). At a second end of the first element 12 there is a coupling portion 22. The coupling portion 22 is circular and defines a cylindrical axis 24 that is at an angle of about 135 degrees to the axis 20 of the joining portion 18.

Similarly, the second element 14 has a joining portion 26 at a first end thereof which defines a longitudinal axis 28 and at a second end it has a coupling portion 30 that defines a cylindrical axis 32 which is also at an angle of about 135 degrees to the longitudinal axis 28 of the joining portion 26. As shown in Figure 1, when the first and second elements are coupled together by means of their coupling portions and the locking ring 16, the cylindrical axes 24 and 32 co-incide.

Referring now to Figure 2, it will be seen that the coupling portion 22 has a circumferentially extending projection 34 which is stepped at its inner end to define a shoulder 36 and increases in diameter towards its free end to provide a frustoconical surface 38. Further there is an annular channel 40 in an end region of the coupling portion 22 which extends circumferentially around the coupling portion 22. There is a lip 42 on each side of the channel 40. Within the channel 40 there is a cup seal 44 which has a base 46 and two tubular side walls 48. The side walls 48 are thicker in their middle regions and are enlarged at their free ends 50.

In regard to the coupling portion 30 it will be noted that it has a rim formation 52 which is stepped to provide a thinner peripheral portion 54. On either side of the rim formation 52 there is a groove 56. The rim formation 52 is received in the seal 44 in the channel 40 with the lips 42 being received in the grooves 56. The coupling portion 30 also has a circumferential projection 58 which is stepped at its inner end to provide a shoulder 60.

The locking ring 16 has a circular cylindrical body portion 62 which has an internal diameter slightly greater than that of the circumferential projection 34 of the coupling portion 22 at its free end. The locking ring 16 also has an inwardly directed flange 64 at one end which has an internal diameter that is suitably less than the external diameter of the circumferential projection 34 at the shoulder 36 so that the inner surface of the flange 64 engages the shoulder 36. At its other end the ring 16 has a further inwardly directed flange 66 which has an internal diameter slightly less than that of the circumferential projection 34 at its free end which is substantially the same as that of the circumferential projection 58, to engage the shoulder 60. The body portion 62 has a suitable length so that when the coupling portion 30 is engaged with the coupling portion 22 the locking ring 16 is able to clip over the projections 34 and 58 and lock them together in a sealed configuration. It will be noted that when the first and second elements 12, 14 are locked together by the locking ring 16 they are still able to rotate about the common axes 24 and 32.

The first element 12, the second element 14 and the locking ring 16 are moulded in a suitable mould from a suitable synthetic plastics material such as ABS or polypropylene.

Referring now to Figures 3 to 6, a further embodiment of a joint is shown generally be reference numeral 110. The joint 110 is also formed from a first element 112, a second element 114 and a locking ring 116. The joint 110 is shown in Figure 3 in its assembled configuration, Figure 4 shows the first element 112 and a seal 144, Figure 5 shows the second element 114 and Figure 6 shows in detail how the elements 112 and 114 mate together.

The first element 112 is hollow and has at one end a joining portion 118 that defines a longitudinal axis 120. The joining portion 118 is connectable to a pipe (not shown). At a second end of the first element 112 there is a coupling portion 122. The coupling portion 122 defines a cylindrical axis 124 that is at an angle of about 135 degrees to the axis 120 of the tubular portion 118.

Similarly, the second element 114 has a joining portion 126 at a first end which defines a longitudinal axis 128 and at a second end it has a coupling portion 130 that defines a cylindrical axis 132 which is also at an angle of about 135 degrees to the longitudinal axis 128 of the joining portion 126. As shown in Figure 3, when the first and second elements are coupled together by means of their coupling portions and the locking ring 116, the cylindrical axes 124 and 132 co-incide.

The coupling portion 122 is stepped to define a shoulder 136. There is a first annular channel 140 in an end region of the coupling portion 122 which extends circumferentially around the coupling portion 122. There is a second annular channel 142 around the first channel 140. The first channel 140 has an inner wall portion 144 that is sloped and which terminates in a step 146. As shown in Figure 6 a seal 148 which has a tubular portion 150 and an outwardly directed flange 152 has its tubular portion located in the first annular channel 140 to define a space between it and the sloped wall portion 144.

The coupling portion 130 has a rim formation 154 which has an inner sloped surface 156 and a cylindrical outer surface 158. The inner surface 156 terminates at a step 160. The rim formation 154 is complementary in shape to the space defined between the seal 148 and the slope in a wall portion 144 so that the end of the rim formation 154 en-

gages the step 146 and the free end of th inner wall portion 144 engages th step 160. The coupling portion 130 further has an annular surface 162 which surrounds the rim formati n 154, so that the flange portion 152 of the seal 148 lies between the annular surface 162 and the annular region in which the second channel 142 is to be found. Further, the coupling portion 130 has a shoulder 164.

The coupling portions 122 and 130 are held together by means of the locking ring 116 as shown in Figure 6. The locking ring 116 has a first inwardly directed flange 166 which engages the shoulder 164 and a further flange 168 which has a suitably larger internal diameter to be able to clip over the shoulder 136 of the coupling portion 122. When the coupling portions 122 and 130 are locked together by the ring 116, they may none the less be pivoted about their co-incident cylindrical axes 124 and 132, thereby varying the angle between the longitudinal axes 120 and 128 to be a suitable value.

By means of the invention a pipe joint is provided that is relatively cheap to manufacture and assemble, is adjustable to cater for variable angles and provides an effective seal.

CLAIMS

1. A variable angle pipe joint which includes a first hollow element having at one end a tubular coupling portion that is circular about a cylindrical axis and which has a first annular channel in an end region thereof, the first channel having an inner wall and an outer wall;

a seal member that has a first tubular portion receivable in the first channel to define a space between the inner wall and a first sealing surface thereof;

a second hollow element having at one end a tubular coupling portion that is also circular about a cylindrical axis and which has a rim formation that is sealingly receivable in the space, the rim formation having an inner surface and an outer surface that is sealingly engageable with the first tubular portion of the seal member; and

a locking ring for holding the first and second elements together in a coupled sealed configuration in which the cylindrical axes co-incide and the first and second elements are relatively pivotal about the co-incident axes.

2. A pipe joint as claimed in Claim 1, in which the seal member has an outwardly directed flange portion, the second element has an annular surface around the rim formation and the first element has a corresponding annular region, the flange portion being engageable between the annular surface and the annular region.

3. A pip j int as claimed in Claim 2, in wich the first lem nt has a second annular channel in the annular region.

4. A pipe joint as claimed in Claim 1, in which the inn r wall has a step ngageabl by the nd of the rim f rmati n.

5. A pipe joint as claimed in Claim 1, in which the inn r surface of the rim formation has a step.

6. A pipe joint as claimed in Claim 5, in which the step in the inn r surface f th rim formati n is engageable by the end of th inner wall f the first el ment.

7. A pipe joint as claimed in Claim 1, in which the inner surface is engageable with the inner wall.

8. A pipe joint as claimed in Claim 1, in which the inner wall is sloped such that the diameter thereof increases downwardly and the inner surface is complementarily sloped.

9. A pipe joint as claimed in Claim 1, in which the first element has at its other end a cylindrical joining portion that is circular about a longitudinal axis that is at an angle to the cylindrical axis of the coupling portion.

10. A pipe joint as claimed in Claim 1, in which the second element has at its other end a cylindrical joining portion that is circular about a longitudinal axis that is at an angle to the cylindrical axis of the coupling portion.

11. A pipe joint as claimed in Claim 1, in which the seal member is a cup seal having the first and a second tubular portion joined together by an annular base web, such that the second tubular portion is locatable between the inner surface and the inner wall.

12. A pipe joint as claimed in Claim 1, in which the outer surface of the rim formation has a step.

13. A pipe joint as claimed in Claim 11, in which the tubular portions of the seal member are thicker between their ends.

14. A pipe joint as claimed in Claim 11, in which the tubular portions are thickest at their free ends.

15. A pipe joint as claimed in Claim 1, in which the first element has an axially projecting circumferential lip about the first channel on the outer side thereof and the second element has a complementary annular channel around the rim formation.

16. A pipe joint as claimed in Claim 1, in which the first element has an axially projecting circumferential lip about its annular channel on the inner side thereof and the second element has a complementary annular channel with the rim formation around it.

17. A variable angle pipe joint which includes

a first hollow element having at one end a tubular coupling portion that is circular about a cylindrical axis and which has a shoulder adjacent its free end;

a second hollow element having at one end a tubular coupling portion that is also circular about a cylindrical axis and which also has a shoulder adjacent its free end, the coupling portions being sealingly engageable with one another; and

a locking ring which has a first flange engageable with the sh uld r of th first el m nt and a second flange which has a larger internal diameter than the first flange and is f a suitable siz to pass ov r the free end f the first element and clip over the sh ulder of the second lement t lock the first and second elem nts together.

18. A pipe j int as claimed in Claim 17, in which the region between the sh ulder and the

free end of the coupling portion of the first element is frusto-conical, being thicker at its free nd.

19. A variable angle pipe joint substantially as described with ref rence to the accompanying drawings.

20. A variable angle pipe joint as claimed in claim 1, substantially as described herein with reference to and as illustrated by any one of the examples shown in the accompanying drawings.

Printed in the UK for HMSO, D8818935, 4/88, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.